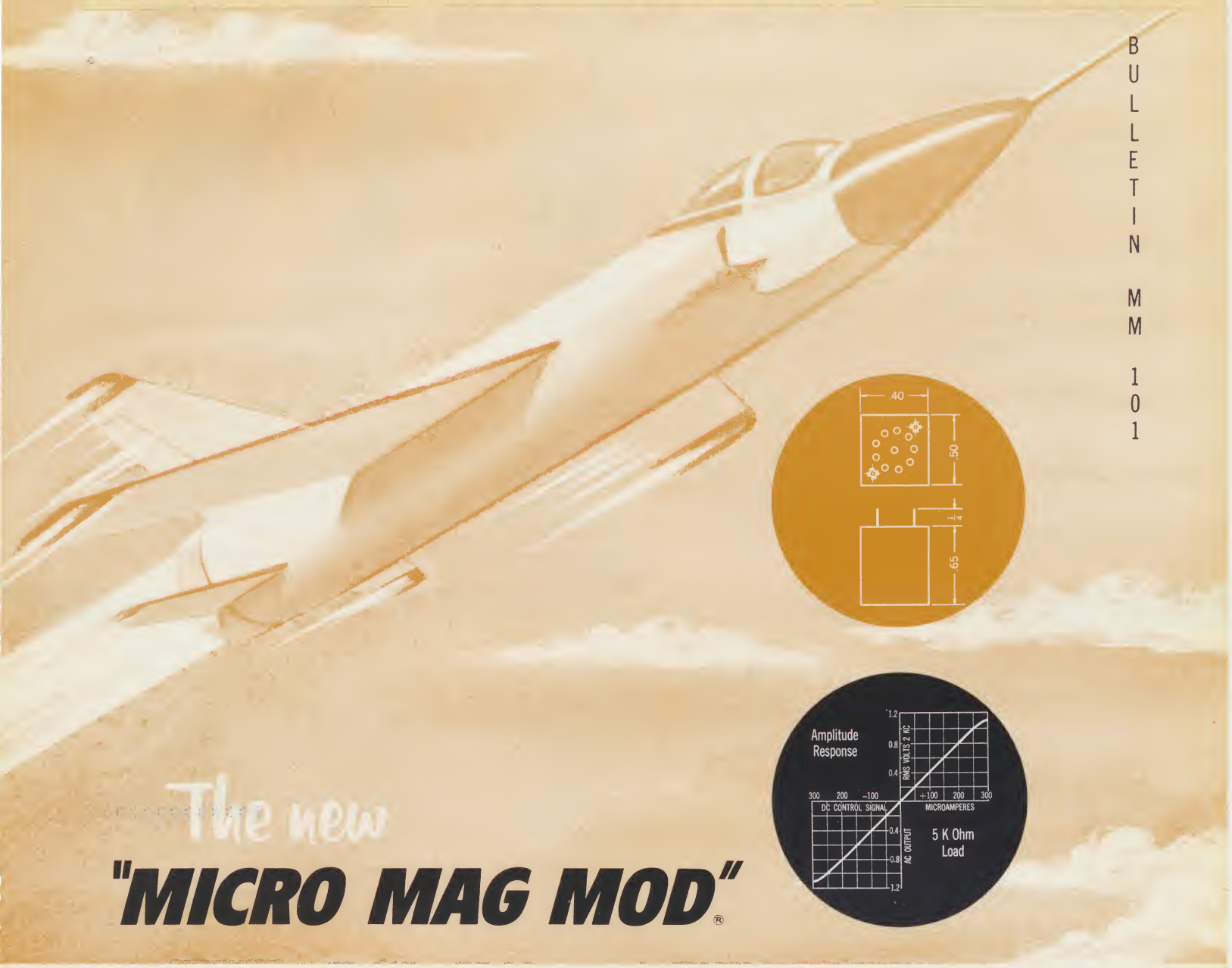
THE CIRCUIT AND FUNDAMENTAL PRINCIPLES OF THESE MAGNETIC MODULATORS AND MULTIPLIERS ARE COVERED BY U.S. PATENT #2758162

BULLETIN MM 101

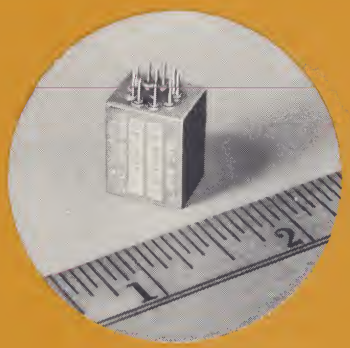


The new

"MICRO MAG MOD"®

MICRO MAGNETIC MODULATORS

Now . . . Reliability in Micro Magnetics! Complete miniaturized magnetic modulators featuring an essentially drift-free circuit with superior phase and gain stability over wide environmental ranges. All the ruggedness, dependability, wide dynamic range and stability that are characteristic of the larger magnetic modulators are engineered into this new magnetic circuit. These "MAG MODS" are shock and vibration proof, provide infinite standby and service life.



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THERE IS NO SUBSTITUTE FOR RELIABILITY

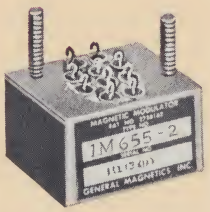
Designed for Reliability in Micro Magnetics –

"MICRO MAG MOD"® MAGNETIC MODULATORS

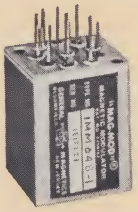
Products shown actual size

- Electrical zero point and gain, repeatability and stability over entire service life
- Extremely broad bandwidth
- Carrier frequencies as high as 1 megacycle
- Input signal current resolution better than 0.01 μa
- Absolute reliability—unlimited life
- Repeatable data over years of continuous, unattended operation
- High shock and vibration proof
- Low milliwatt power consumption

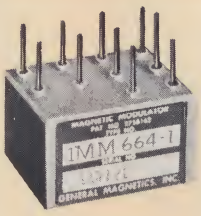
"MAG MODS" provide four quadrant operation, extreme stability with negligible change of phase, gain and zero position over a wide temperature range. Design is simple, lightweight, rugged with no vacuum tubes, semiconductors or moving parts to limit life. "MAG MODS" offer infinite design possibilities and impedance levels, and are adaptable for algebraic addition, subtraction, multiplying, dividing, raising to a power and vector summing.



Micro Magnetic Modulator Type IMM-655-2

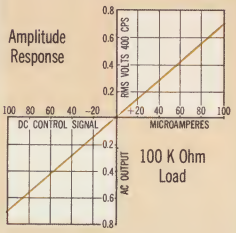


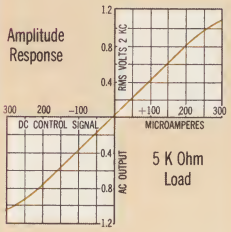
Micro Magnetic Modulator Type IMM-648-1

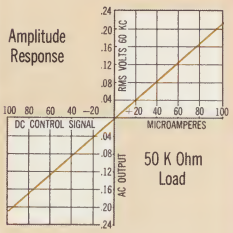


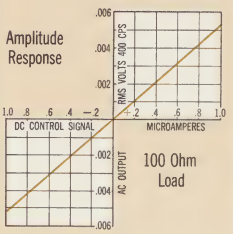
Micro Magnetic Modulator Type IMM-664-1

Micro Magnetic Modulator Type IMM-680-1



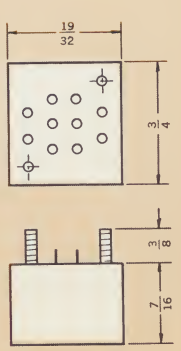


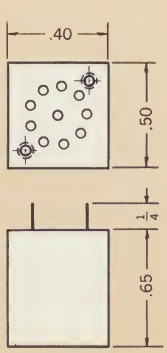


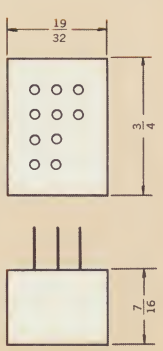


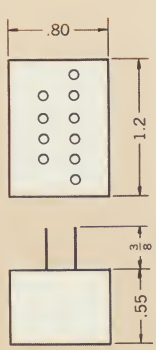
TYPE NUMBER	IMM-655-2	IMM-648-1	IMM-664-1	IMM-680-1
Reference Carrier Voltage and Frequency	3 V @ 400 cps	2 V @ 2 KC	10 V @ 60 KC	115 V @ 400 cps
Input Control Signal Range	0 to ±100 μa DC	0 to ±300 μa DC	0 to ±100 μa DC	0 to ±10 μa DC
DC Resistance of Input DC Signal Winding	3 K ohms	1400 ohms	90 ohms	20 K ohms
AM Phase Reversing AC Output Range	0 to 0.8 V RMS @ 400 cps	0 to 1.0 V RMS @ 2 KC	0 to 200 mv RMS @ 60 KC	0 to 30 mv RMS @ 400 cps
Differential Gain RMS mv AC Output/μa DC Signal Input	7 mv/μa	4 mv/μa	2 mv/μa	5 mv/μa
AC Output Null (Noise Level) mv RMS	5 mv RMS Max.	5 mv RMS Max.	10 mv RMS Max.	100 mv RMS Max.
Output Impedance	14 K ohms	1000 ohms	11 K ohms	Approx. 150 ohms
External Load	100 K ohms	5 K ohms	50 K ohms	100 ohms
Excitation (Carrier Winding) Impedance	3 K ohms	1700 ohms	750 ohms	90 to 100 K ohms
Zero Drift over Temp. Range Referred to DC Input Terminals	±0.1 μa Max.	0.5 μa Max.	—	0.05 μa Max.
Hysteresis in Percent of Max. Input DC Signal	0.2% Max.	0.2% Max.	0.5% Max.	0.1% Max.
% Harmonic Distortion in Output Product Wave	15%	10% to 15%	5%	20%
Temperature Range	−55°C to +125°C	−55°C to +125°C	−55°C to +125°C	−55°C to +125°C
Frequency Response	5 K Series, 108 cps	Over 200 cps	Over 5 KC	Over 100 cps
Overall Dimensions (in Inches)	19/32 x 3/4 x 7/16	0.4 x 0.5 x 0.65	19/32 x 3/4 x 7/16	1/2 x 27/32 x 27/32
Type of Mounting	Two 2-56 Studs	Two 0-80 Inserts	Printed Circuit Board 1/10th Grid Plug-in	Two 4-40 Studs
Approximate Weight (in Ounces)	0.2	0.1	0.2	0.2

100uvRMS Max.
****









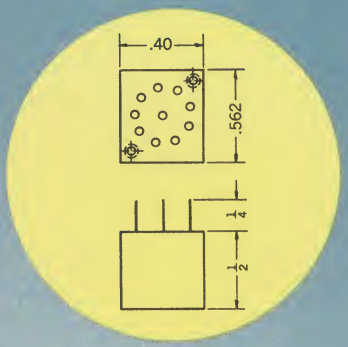
GENERAL MAGNETICS • INC

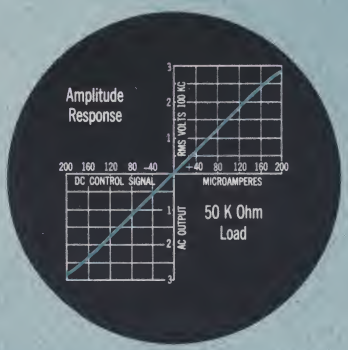
135 BLOOMFIELD AVENUE
BLOOMFIELD, NEW JERSEY, U.S.A.

Litho in U.S.A.

"MAG MOD"®
MICRO MAGNETIC MODULATORS

BULLETIN MM 101X





Reliability plus in Micro Magnetics!

Including 5 New Models! Completely miniaturized magnetic modulators featuring an essentially drift-free circuit with superior phase and gain stability over wide environmental ranges. All the ruggedness, dependability, wide dynamic range and stability that are characteristic of the larger magnetic modulators are engineered into this new magnetic circuit. MICRO "MAG MODS" are shock and vibration proof, provide infinite standby and service life.

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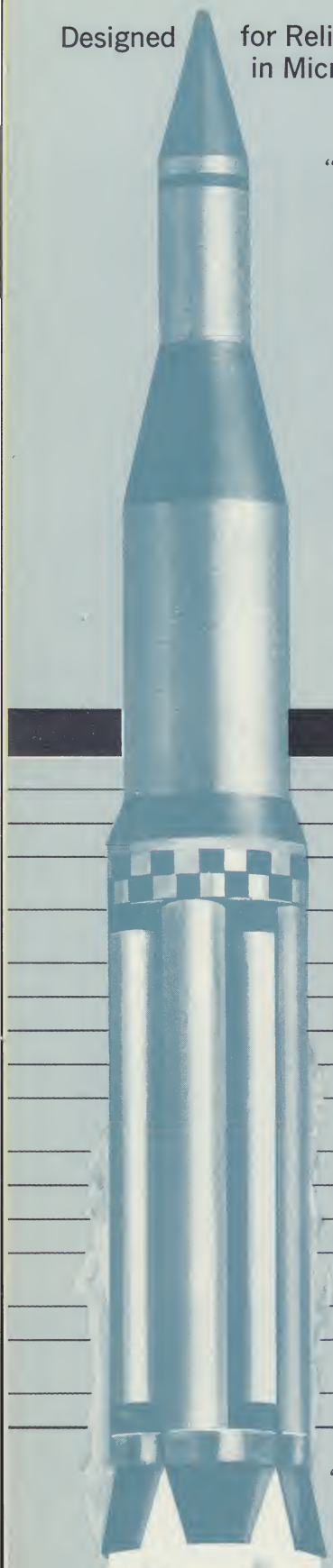
"MAG MOD"® MICRO



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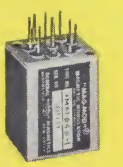
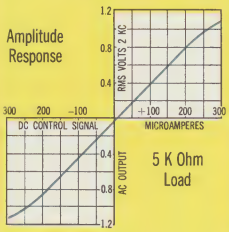
- **Electrical zero point and gain, repeatability and stability over entire service life**
- **Extremely broad bandwidth**
- **Carrier frequencies as high as 1 megacycle**
- **Input signal current resolution better than 0.01 μa**
- **Absolute reliability—unlimited life**
- **Repeatable data over years of continuous, unattended operation**
- **High shock and vibration proof**
- **Low milliwatt power consumption**

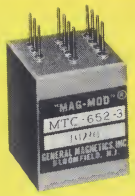
Products shown actual size



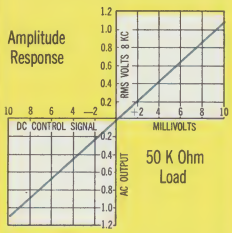
Micro Magnetic Modulator Type IMM-648-1



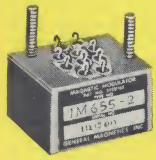
5 K Ohm Load



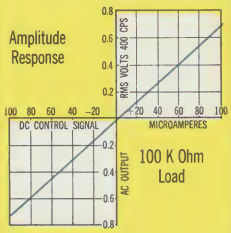
Micro Magnetic Modulator Type MTC-652-3



50 K Ohm Load

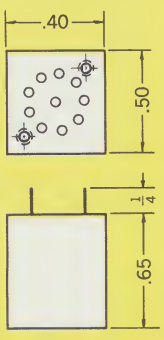


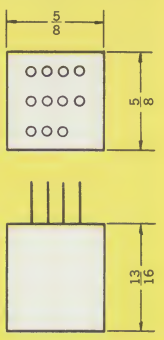
Micro Magnetic Modulator Type IMM-655-2

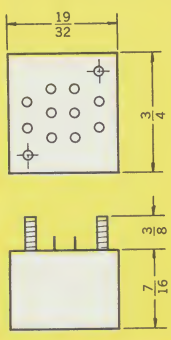


100 K Ohm Load

TYPE NUMBER	IMM-648-1	MTC-652.3	IMM-655-2
Reference Carrier Voltage and Frequency	2 V @ 2 KC	14 V RMS @ 8 KC	3 V @ 400 cps
Input Control Signal Range	0 to ±300 μa DC	0 to ±10 mv DC	0 to ±100 μa DC
DC Resistance of Input DC Signal Winding	1400 ohms	20 ohms	3 K ohms
AM Phase Reversing AC Output Range	0 to 1.0 V RMS @ 2 KC	0 to 2.0 V RMS @ 8 KC	0 to 0.8 v RMS @ 400 cps
Differential Gain RMS mv AC Output/μa DC Signal Input	4 mv/μa	100 mv RMS/mv DC	7 mv/μa
AC Output Null (Noise Level) RMS	5 mv RMS Max.	30 mv RMS Max.	5 mv RMS Max.
Output Impedance	1000 ohms	16 K ohms	14 K ohms
External Load	5 K ohms	50 K ohms	100 K ohms
Excitation (Carrier Winding) Impedance	1700 ohms	1.5 K ohms	3 K ohms
Zero Point Drift over Temp. Range Referred to DC Input Terminals	0.5 μa Max.	±50 μv	±0.1 μa Max.
Hysteresis in Percent of Max. Input DC Signal	0.2% Max.	0.2%	0.2% Max.
% Harmonic Distortion in Output Wave	10% to 15%	5%	15%
Temperature Range	–55°C to +125°C	–55°C to +100°C	–55°C to +125°C
Frequency Response	Over 200 cps	Approx. 3000 cps with 5000 ohm Source	5 K Series, 108 cps
Overall Dimensions (in Inches)	0.4 x 0.5 x 0.65	5/8 x 5/8 x 13/16	19/32 x 3/4 x 7/16
Type of Mounting	Two 0-80 Inserts	Plug-in	Two 2-56 Studs
Approximate Weight (in Ounces)	0.1	0.4	0.2







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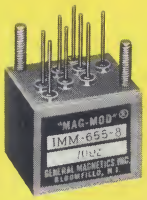
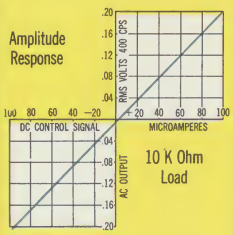
MAGNETIC MODULATORS

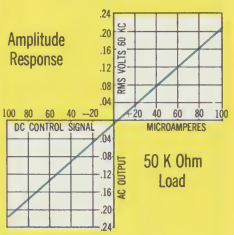
ALL "MAG MODS" CONFORM TO MIL-T-27A AND MIL-E-5400 SPECIFICATIONS

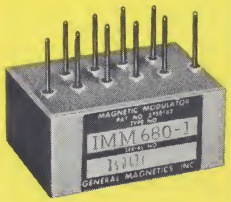


Micro Magnetic Modulator Type IMM-655-8

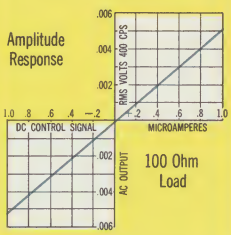


Micro Magnetic Modulator Type IMM-664-1

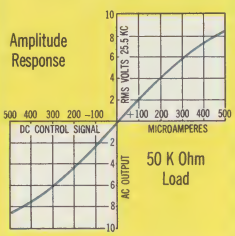




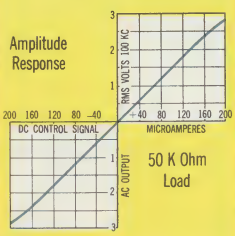
Micro Magnetic Modulator Type IMM-680-1

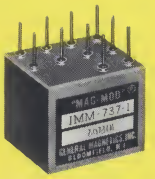


Micro Magnetic Modulator Type IMM-688-4

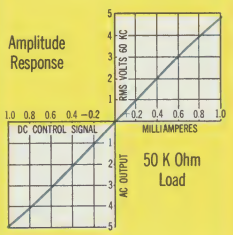


Micro Magnetic Modulator Type IMM-720-1

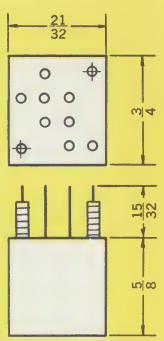


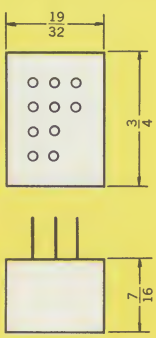


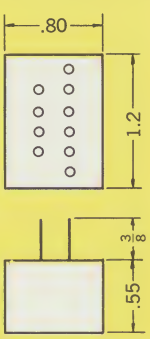
Micro Magnetic Modulator Type IMM-737-1

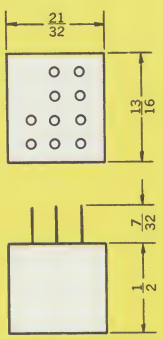


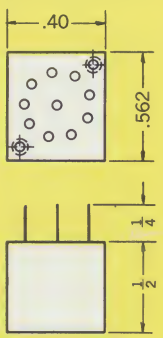
IMM-655-8	IMM-664-1	IMM-680-1	IMM-688-4	IMM-720-1	IMM-737-1
26 V RMS @ 400 cps	10 V @ 60 KC	115 V @ 400 cps	10 V RMS @ 25.5 KC	3 V RMS @ 100 KC	10 V RMS @ 60 KC
0 to ±100 μa DC	0 to ±100 μa DC	0 to ±10 μa DC	0 to ±500 μa DC	0 to ±200 μa DC	0 to ±1000 μa DC
2.8 K ohms	90 ohms	20 K ohms	150 ohms	1.3 K ohms	90 ohms
0 to 0.2 V RMS @ 400 cps	0 to 200 mv RMS @ 60 KC	0 to 30 mv RMS @ 400 cps	0 to 10 V RMS @ 25.5 KC	0 to 3 V RMS @ 100 KC	0 to 5 V RMS @ 60 KC
2 mv RMS/μa DC	2 mv/μa	5 mv/μa	20 mv RMS/μa DC	15 mv RMS/μa DC	5 mv RMS/μa DC
1 mv RMS Max.	10 mv RMS Max.	100 μv RMS Max.	—	—	25 mv RMS Max.
4.5 K ohms	11 K ohms	Approx. 150 ohms	22 K ohms	4.7 K ohms	6.5 K ohms
10 K ohms	50 K ohms	100 ohms	50 K ohms	50 K ohms	50 K ohms
12.3 K ohms	750 ohms	90 to 100 K ohms	2.1 K ohms	300 ohms	1.5 K ohms
< ±0.25 μa	—	0.05 μa Max.	±0.1%	—	±0.2%
0.3%	0.5% Max.	0.1% Max.	0.25%	0.2%	0.15%
10%	5%	20%	5%	3% Max.	5% Max.
–55°C to +100°C	–55°C to +125°C	–55°C to +125°C	172°F ±5°F	–55°C to +125°C	–55°C to +125°C
—	Over 5 KC	Over 100 cps	1100 cps for 5 K ohm Source	1100 cps for 50 ohm Source✻	—
$^{21}/_{32}$ x $^{3}/_{4}$ x $^{5}/_{8}$	$^{19}/_{32}$ x $^{3}/_{4}$ x $^{7}/_{16}$	$^{1}/_{2}$ x $^{27}/_{32}$ x $^{27}/_{32}$	$1^{3}/_{16}$ x $^{21}/_{32}$ x $^{1}/_{2}$	0.4 x 0.562 x 0.5	0.4 x 0.75 x 0.625
Two 2-56 Nc-24 Studs	Printed Circuit Board 1/10th Grid Plug-in	Two 4-40 Studs	Printed Circuit Board Plug-in	2 0-80 Tapped Holes	Printed Circuit Board Plug-in
0.4	0.2	0.2	0.4	0.14 (4 Grams)	0.3

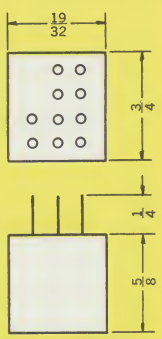










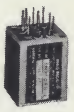


✻ 20 KC for 10 K ohm Source; 40 KC for 50 K ohm Source; 50 KC for 100 K ohm Source

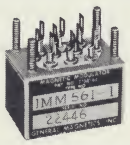
The "MAG MOD"® Family of

MAGNETIC MODULATORS

Micro Magnetic Modulators

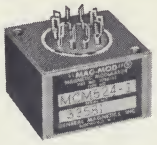


Miniaturized Magnetic Modulators



Standard Magnetic Modulators

Miniaturized Multiplying Modulators



Miniaturized High-stability Oscillators

Prime Component in Solid State Design — The "MAG MOD" has proven to be the most reliable module circuit block in aircraft and space vehicle flight control systems developed to date. Its ruggedness, dependability, repeatability, universal energy and impedance ranges, and superior performance have resulted in its use in many military and commercial products where reliability is a prime factor.

Typical of the applications where the "MAG MOD" is utilized are missile, satellite and aircraft control and position circuits, fire control and bombing computers, analog circuit functions, antenna position data conversion, and an infinite variety of conversion, computing and modulation operations.

Custom Requirements — Customized application engineering, whenever required, will be performed on a no charge basis. Please send drawings or specifications with inquiries.

Bulletins Available — Request brochures on Miniaturized Magnetic Modulators Bulletin MM 102, Standard Magnetic Modulators Bulletin MM 103, Miniaturized Multiplying Modulators Bulletin MM 104, and Miniaturized High-stability Oscillators Bulletin MM 105.

GENERAL MAGNETICS • INC

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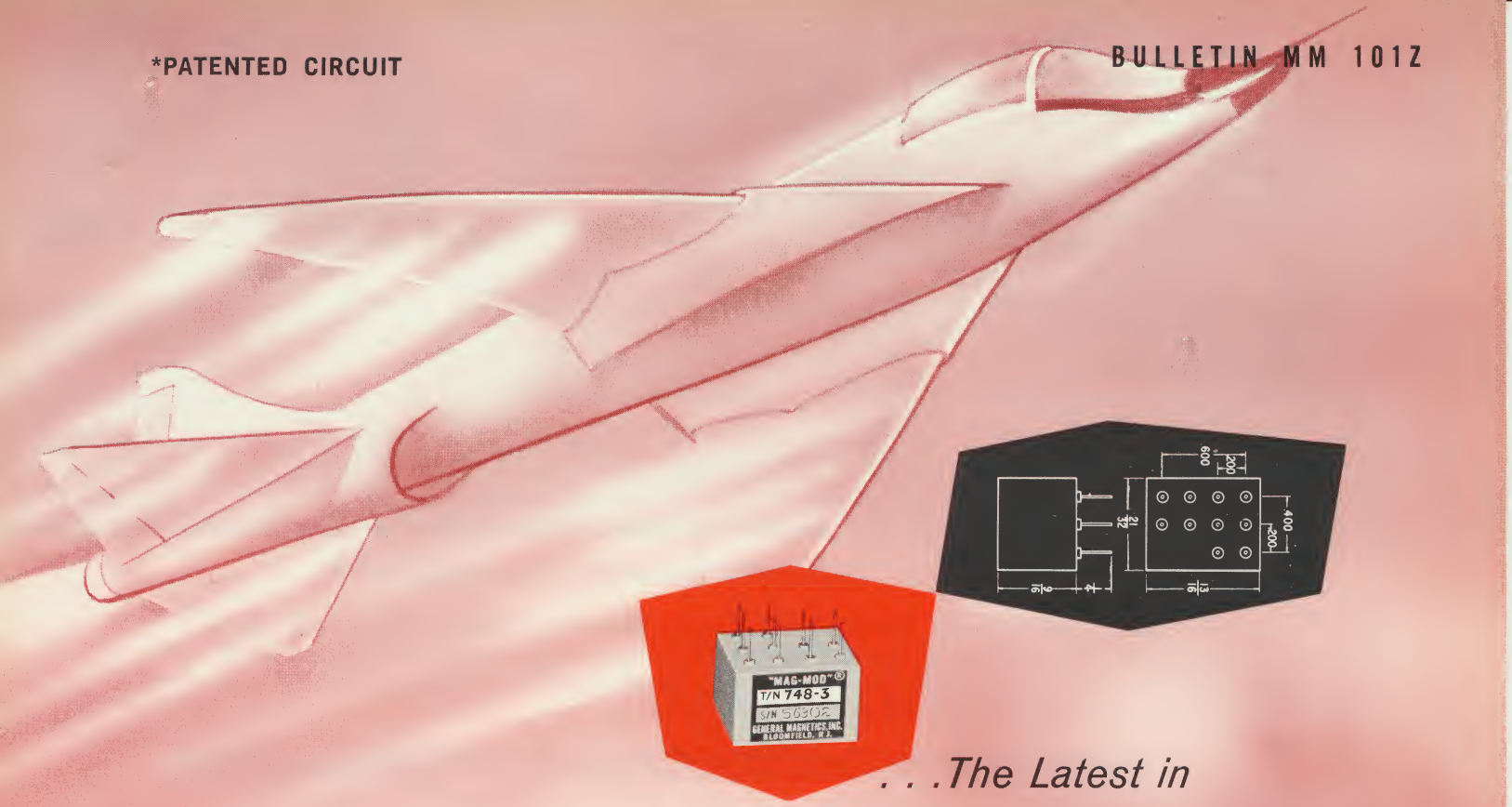
Litho in U.S.A.

*PATENTED CIRCUIT

BULLETIN MM 101Z



. . .The Latest in

"MAG MOD"®

micro

magnetic modulators

...designed for maximum reliability in Micro magnetics!

4 New Models Now Available!

Completely miniaturized magnetic modulators featuring an essentially drift-free circuit with superior phase and gain stability over wide environmental ranges. All the ruggedness, dependability, wide dynamic range and stability that are characteristic of the larger magnetic modulators are engineered into this new magnetic circuit. MICRO "MAG MODS" are shock and vibration proof, provide infinite standby and service life.

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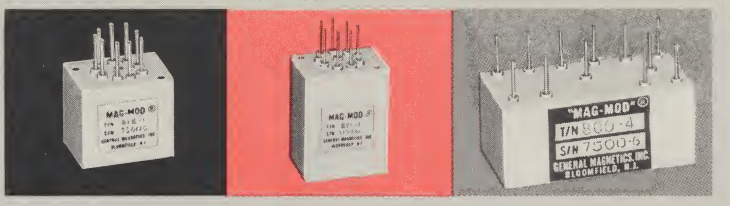


Now....from GENERAL MAGNETICS

Model 748-3
Shown actual size

"MAG MOD"® MICRO MAGNETIC MODULATORS

Four latest models shown

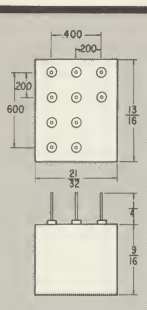
Designed for Reliability in Micro Magnetics

"Mag MODS" provide four quadrant operation, extreme stability with negligible change of phase, gain and zero position over a wide temperature range. Design is simple, lightweight, and rugged — with no vacuum tubes, semiconductors or moving parts to limit life.

TYPE NUMBER	IMM 818-1	IMM 821-1	IMM 748-3	IMM 800-4
Reference Carrier Voltage and Frequency	3.0 V RMS @ 63 KC	3 V RMS @ 96 KC	10 V RMS @ 25.5 KC	8 V RMS @ 400 cps.
Input Control Signal Range	0 to ± 100 *ua*	0 to ± *ua* 100 (DC to 1000 Cps.)	0 to ± 50 *ua* (DC to 2000 cps.)	0 to ± 100 *ua* DC
DC Resistance of Input DC Signal Winding	130 ohms	150 ohms	175 ohms	3 Signal Windings, 5.5 K, 6.5 K, 7.5 K ohms
AM Phase Reversing AC Output Range	0 to 1 V RMS	0 to 0.6 V RMS	0 to 1.0 V RMS	0 to 1.0 V RMS (1% Linearity)
Differential Gain RMS mv. AC Output/ua DC Sig. Input	10 MV RMS/*ua*	6 MV RMS/*ua*	20 MV RMS/*ua*	7 MV/*ua* each winding, 21 MV RMS/*ua* all series
AC Output Null (Noise Level) RMS	10 MV RMS Max.	20 MV RMS Max.	10 MV RMS Max.	10 MV RMS Max.
Output Impedance	5.5 K ohms	7.5 K ohms	28 K ohms	21 K ohms
External Load	100 K ohms	100 K ohms	50 K ohms	100 K ohms
Excitation (Carrier Winding) Impedance	500 ohms	115 ohms	500 ohms	6 K to 8 K ohms
Zero Point Drift over Temp. Range Referred to DC Input Terminals	0.2%	0.2%	0.2%	0.2%
Hysteresis in Percent of Max. Input DC Signal	0.2%	0.2%	0.2%	0.1%
% Harmonic Distortion in Output Wave	5%	5%	3%	5%
Temperature Range	0°C to +100°C	0°C to +100°C	0°C to +85°C	−55°C to +86°C
Frequency Response	1000 cps. with source impedance of 1000 ohms	1000 Cps.	2000 cps.	50 cps.
Overall Dimensions (in inches)	0.562 x 0.40 x 0.5	0.562 x 0.40 x 0.5	21/32 x 13/16 x 5/16	0.5 x 0.575 x 1.175
Type of Mounting	Printed Circuit Board	Printed Circuit Board	Printed Circuit Board 1/10 in. grids	Printed Circuit Board 1/10 inch grids
Approximate Weight (in ounces)	0.12 ounces	0.12 ounces	0.3 ounces	0.4 ounces

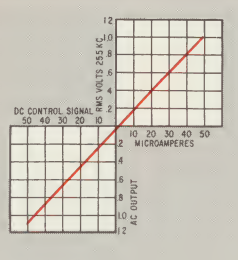
All "MAG MODS" conform to MIL-T-27A and MIL-E*5400 Specifications

*The circuit and fundamental principles of these magnetic modulators and multipliers are covered by U.S. Patent #2758162.



Pin diagram Model 748-3

"MAG MODS" offer infinite design possibilities and impedance levels, and are adaptable for algebraic addition, subtraction, multiplying, dividing, raising to power, vector summing.



Amplitude response curve Model 748-3

- Electrical zero point and gain, repeatability and stability over entire service life
- Extremely broad bandwidth
- Carrier frequencies as high as 1 megacycle
- Input signal current resolution better than 0.01 *ua*
- Absolute reliability—unlimited life
- Repeatable data over years of continuous, unattended operation
- High shock and vibration proof
- Low milliwatt power consumption

Prime Components in Solid State Design — **The "Mag MOD" family of Magnetic Modulators** has proven to be the most reliable module circuit block in aircraft and space vehicle flight control systems developed to date. They are universally accepted and in use in many military and commercial products where reliability is a prime factor.

Also available from G/M a complete line of magnetic modulators, magnetic multiplying modulators and high stability oscillators and solid state relays. Order by bulletin numbers MM 101 Series Micro Magnetic Modulators, MM 102 Miniaturized Magnetic Modulators, MM 103 Standard Magnetic Modulators, MM 104 Miniaturized Multiplying Modulators, MM 105 Miniaturized High-stability Oscillators, MM 107 Solid State Magnetic Relays.

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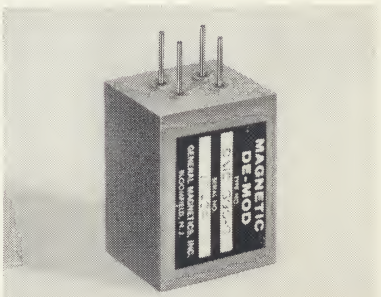
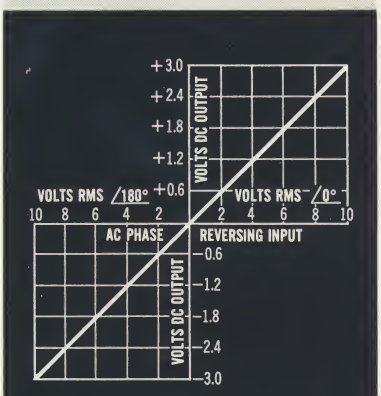
THERE IS NO SUBSTITUTE FOR RELIABILITY

FOR UNLIMITED LIFE AND SUPERIOR PERFORMANCE

General Magnetics'

Solid State Magnetic Demodulators





Amplitude Response Curve

Customized engineering, when required, will be performed on a no-charge basis.

Illustrated literature and technical data will be sent promptly on request.

HIGH RELIABILITY PLUS! The new G/M Magnetic Demodulator is a solid state circuit for converting phase reversing AC signal voltages into phase detected polarity reversing DC voltages. The amplitude and polarity of the DC output are directly proportional to the phase and amplitude of the AC signal.

FEATURES

- High Reference Impedance Resulting in Very Small Reference Power Requirements
- Output as High as ± 10 V. DC in Present Units
- Very Low DC Offset Null Voltages (As low as 0.1% of full scale)
- Operation Over Wide Environmental Conditions
- Completely Solid State — No Moving Parts
- Signal and Reference Terminals may be Isolated
- Low Output Impedance
- Small Physical Size

SPECIFICATIONS DMD 1017-1 (TYPICAL UNIT)

TEMPERATURE RANGE	−55° C to +71° C
REFERENCE	115 V. — 400 CPS
REFERENCE IMPEDANCE LEVEL	>100 K
SIGNAL	0 to 10 V. RMS
SIGNAL IMPEDANCE LEVEL	>10 K
OUTPUT IMPEDANCE	<1 K
OUTPUT	±3 V. DC ±5% to a 2 K LOAD
FREQUENCY RESPONSE	40 CPS
NULL	<2 MV
DC POWER	28 V

The new solid state demodulators feature contactless switching for high vibration and shock resistance. Stability of performance and ruggedized construction mean they are the ideal solution to problems inherent in today's critical applications.

Other G/M Components

Also available is a complete line of magnetic modulators, magnetic multiplying modulators, high stability oscillators and relays. Order by bulletin numbers MM 101 Series Micro Magnetic Modulators, MM 102 Miniaturized Magnetic Modulators, MM 103 Standard Magnetic Modulators, MM 104 Miniaturized Multiplying Modulators, MM 105 Miniaturized High-stability Oscillators, MM 106 Micro Magnetic Multiplying Modulators, MM 107 Magnetic Relays.

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DIVISION MODULE SPEC.

1.0 GENERAL INFORMATION:

1.1 Customer _____
1.2 Date _____
1.3 Model No. _____
1.4 Ambient Temperature Range _____

2.0 NUMERATOR:

2.1 Input Impedance _____
2.2 Voltage Range of Numerator _____
2.3 Frequency _____

3.0 DENOMINATOR:

3.1 Input Resistance _____
3.2 Voltage Range of Denominator _____
3.3 Current Range of Denominator _____

4.0 OUTPUT:

4.1 Distortion _____
4.2 Phase Shift _____
4.3 Response Time _____ % Absolute _____
4.4 Accuracy of Division % Full Scale _____
_____
4.5 Product Accuracy (See Note) _____
4.6 Final Load _____
4.7 Maximum Output Voltage _____
4.8 Output Impedance _____

5.0 POWER SUPPLY:

5.1 D.C. Power Supply Voltage Available _____
5.2 Current Limitation (if any) _____
5.3 Regulation of Supply _____

NOTE:

Because this unit is essentially a multiplier a product accuracy specification may also be necessary.

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DIVISION MODULE SPEC.

6.0 MECHANICAL SPECIFICATIONS:

Type of Mounting _____

Place Dimensions on Sketch Below:

Further Information may be obtained from:

Phone _____

Extension _____

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MODULATOR SPEC

1.0 EXCITATION:
- 1.1 Amplitude _____
- 1.2 Frequency _____
- 1.3 Variations _____

2.0 BIAS:
- 2.1 Source _____
- 2.2 Voltage _____
- 2.3 Impedance _____

3.0 OUTPUT:
- 3.1 Voltage range and load _____
- 3.2 Gain Slope (MV RMS/UA DC) _____
- 3.3 Phase angle _____
- 3.4 No. of outputs _____
- 3.5 Null (Noise level) % of full scale output _____
- 3.6 Linearity _____

4.0 INPUT CONTROL SIGNAL
- 4.1 Input range - current in ua or V DC _____
- 4.2 Impedance of signal source _____
- 4.3 Band width (3 db point) _____
- 4.4 Signal range (If multiplier, product accuracy) _____

5.0 TEMPERATURE RANGE:
- 5.1 Gain vs. temp _____
- 5.2 Phase vs. temp _____
- 5.3 Zero drift in ua in reference to input _____

6.0 INPUT SIGNAL ZERO POINT ADJUSTMENT:
- 6.1 Internal or external _____

7.0 WAVE QUALITY:
- 7.1 Maximum distortion _____

8.0 ENVIRONMENT:

8.1 Ambient temp range _____ to _____

8.2 Vibration spec _____

8.3 Shock spec _____

8.4 Humidity spec _____

8.5 Altitude spec _____

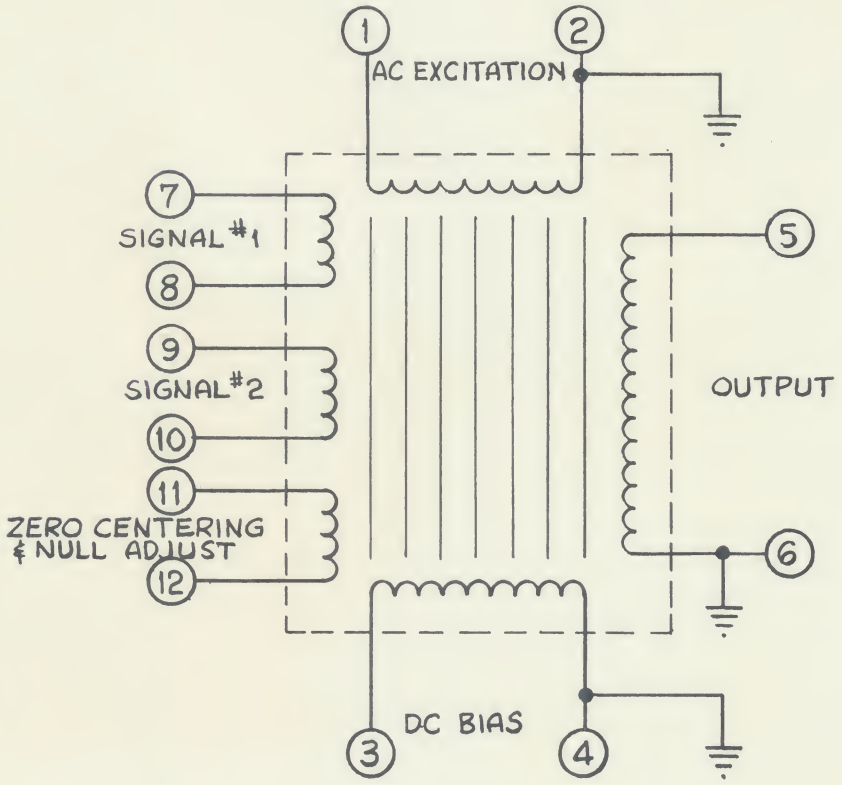
8.6 Others _____

_____

_____

_____

9.0 SCHEMATIC:

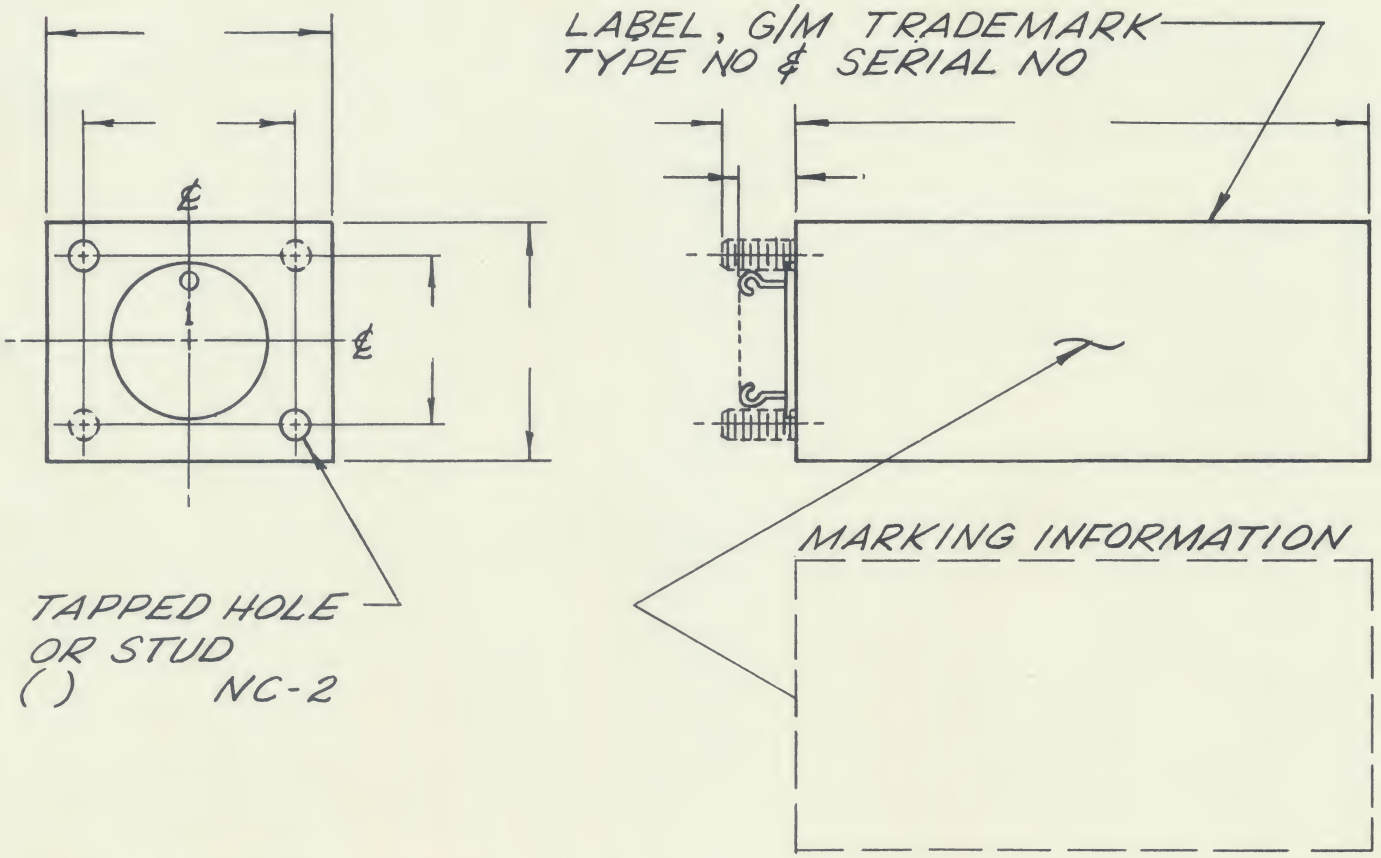


10.0 WEIGHT:

10.1 Calculated _____

10.2 Actual _____

11.0 PHYSICAL DIM:



11.1 TERMINAL TYPES

11.1.1 straight _____

11.1.2 hooked _____

11.1.3 flat tubular & pierced _____

11.1.4 flattened & pierced _____

11.1.5 Applicable specs.

11.2 PIN ARRANGEMENT

11.2.1 7 pin min tube socket

11.2.2 9 pin min tube socket

11.2.3 Octal socket

11.2.4 .200 grid

11.2.5 Other (show sketch below)

11.2.6 Applicable specs.

11.3 CONTAINER
- 11.3.1 Cold rolled steel Hermetically sealed (Standard)
- 11.3.2 Mu-metal, Hermetically sealed
- 11.3.3 Stainless steel, Hermetically sealed
- 11.3.4 Molded silicone
- 11.3.5 Other _____
- 11.3.6 Applicable spec _____

11.4 IMPREGNATION:
- 11.4.1 Dip (Standard)
- 11.4.2 Vacuum
- 11.4.3 Applicable spec _____

11.5 POTTING:
- 11.5.1 Tuffernal (Standard)
- 11.5.2 Silicone (specify type) _____
- 11.5.3 Other _____
- 11.5.4 Applicable spec _____

12.0 G/M Reference drawings
- 12.1 Outline _____
- 12.2 Assembly _____
- 12.3 Parts list _____
- 12.4 Other _____

13.0 CUSTOMER DRAWINGS (List below)
- 13.1 _____
- 13.2 _____
- 13.3 _____